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National Advisory Committee for Aeronautics

Research Abstracts

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CURRENT NACA REPORTS

NACA TN 2644

EXPERIMENTAL INVESTIGATION OF AN NACA 64A010 AIRFOIL SECTION WITH 41 SUCTION SLOTS ON EACH SURFACE FOR CONTROL OF LAMINAR BOUNDARY LAYER. Dale L. Burrows and Milton A. Schwartzberg. April 1952. 37p. diagrs., photos. (NACA TN 2644)

A wind-tunnel investigation of an NACA 64A010 airfoil model with 41 suction slots per surface indicated that laminar flow could be obtained over 0.91 chord on one surface up to a Reynolds number of 10×10^6 with an estimated net drag saving of about 50 percent over the plain smooth airfoil. Extensive laminar flow could not be obtained at higher Reynolds numbers because of increased sensitivity of the flow to minute surface irregularities and slight inaccuracies of slot-entry contour.

NACA TN 2659

A MINATURE ELECTRICAL PRESSURE GAGE UTILIZING A STRETCHED FLAT DIAPHRAGM. John L. Patterson. April 1952. 47p. diagrs., photos., 2 tabs. (NACA TN 2659)

A variable-air-gap, inductance-type, electrical pressure gage is described that is basically 7/16 inch in diameter and 1/4 inch in thickness. The gage was designed to measure accurately pressures fluctuating at high frequencies and has proved to be of value as a general-purpose electrical gage for aeronautical work where small size and minimum response to acceleration forces are important factors. Design equations and curves are presented which can be used to predict the deflections and fundamental natural frequencies of stretched flat diaphragms.

NACA TN 2677

WING-BODY INTERFERENCE AT SUPERSONIC SPEEDS WITH AN APPLICATION TO COMBINATIONS WITH RECTANGULAR WINGS. Jack N. Nielsen and William C. Pitts. April 1952. 63p. diagrs., 2 tabs. (NACA TN 2677)

An exact theoretical method is developed that permits the determination of the pressure field of a wing-body combination having a circular body and wings with supersonic leading and trailing edges. Detailed calculations are performed for the case of a rectangular wing or all-movable control surface on a body at zero angle of attack. Design charts are presented showing the effect of interference on the lift and center-of-pressure position of the wings. The physical basis of the interference is discussed.

NACA TN 2678

ABNORMAL GRAIN GROWTH IN S-816 ALLOY. A. I. Rush, J. W. Freeman and A. E. White, University of Michigan. April 1952. 30p. photos., diagrs., tab. (NACA TN 2678)

Preliminary results are presented from an investigation to establish the fundamental causes of abnormal grain growth in S-816 alloy under conditions encountered during forging of blades for aircraft gas turbines. The data are confined to experiments to produce abnormally large grains in bar stock under controlled conditions. It was found that critical deformation for grain growth is apparently independent of temperature of deformation; repeated critical deformations between reheats to 2150° F produce much larger grains than a single critical deformation; grain growth characteristics are sensitive to prior history; and abnormal grain growth can be induced by temperature cycling alone to temperatures of 2150° F with certain prior histories.

NACA TN 2684

A LOW-SPEED INVESTIGATION OF A FUSELAGE-SIDE AIR INLET FOR USE AT TRANSONIC FLIGHT SPEEDS. Mark R. Nichols and Edwin B. Goral. April 1952. 60p. diagrs., photos., tab. (NACA TN 2684. Formerly RM L7A06)

Low-speed pressure-recovery and surface-pressure measurements for a twin fuselage-side air-inlet arrangement intended for use at transonic speeds are presented. The model was developed by adding a canopy and nose-wheel fairing to basic transonic annular inlet studied in TN 2685. The results indicate shape requirements of fuselage nose, canopy, and nose-wheel fairing for maintaining substream surface velocities everywhere ahead of entrance.

NACA TN 2685

A LOW-SPEED INVESTIGATION OF AN ANNULAR TRANSONIC AIR INLET. Mark R. Nichols and Donald W. Rinkoski. April 1952. 38p. diagrs., photos. (NACA TN 2685. Formerly RM L6J04)

Low-speed wind-tunnel tests were conducted as preliminary steps in the study of fuselage-air-inlet

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arrangements believed suitable for use at transonic speeds. The forward part of the model consisted of an NACA 1-85-050 cowling located at the base of the long protruding fuselage nose designed to maintain substream surface velocities everywhere ahead of the entrance and thereby to avoid or minimize adverse boundary-layer-shock interaction effects up to low supersonic speeds. Pressure-recovery and surface-pressure measurements are presented for the model with three fuselage nose shapes for ranges of angle of attack and inlet-velocity ratio useful for high-speed flight.

NACA TN 2691

THEORETICAL AND EXPERIMENTAL ANALYSIS OF ONE-DIMENSIONAL COMPRESSIBLE FLOW IN A ROTATING RADIAL-INLET IMPELLER CHANNEL. Seymour Lieblein. April 1952. 47p. diagrs., photo. (NACA TN 2691)

An analysis of the one-dimensional compressible flow in a radial-inlet impeller channel was conducted in order to provide an insight into the characteristics of the passage mean flow. A theoretical investigation of the flow in an illustrative impeller channel showed the general flow behavior, location of critical section and effect of losses in an impeller channel. A further analysis was conducted of the one dimensional flow in a previously reported experimental radial-inlet impeller. The general flow behavior, effective flow area, inlet throat formation, maximum flow, and loss variations were analyzed.

NACA TM 1317

A SIMPLE NUMERICAL METHOD FOR THE CALCULATION OF THE LAMINAR BOUNDARY LAYER. (Ein einfaches numerisches Verfahren zur Berechnung der laminaren Grenzschicht). K. Schröder. April 1952. 47p. diagrs., 3 tabs. (NACA TM 1317. Trans. from Zentrale für wissenschaftliches Berichtswesen der Luftfahrtforschung, Berlin. FB 1741; Deutsche Versuchsanstalt für Luftfahrt E. V., Berlin. Institut für Aerodynamik, February 25, 1943.)

An iteration difference method for the calculation of the incompressible laminar boundary layer is described. The method uses Prandtl's boundary layer equation and the boundary conditions directly and permits the attainment of an arbitrary accuracy. The method has been tested successfully in the continuation of the Blasius profile on the flat plate, on the circular cylinder investigated by Heimenz and on an elliptical cylinder of fineness ratio 1:4. The method makes possible the testing of previously developed methods, all of which contain important assumptions.

BRITISH REPORTS

N-14191*

National Gas Turbine Establishment (Gt. Brit.)
STUDIES ON THE SPONTANEOUS IGNITION OF FUELS INJECTED INTO A HOT AIR STREAM. PART III. THE EFFECT OF CHEMICAL FACTORS UPON THE IGNITION DELAY OF KEROSINE-AIR MIXTURES. B. P. Mullins. October 1951. 57p. 31 tabs., diagrs. (NGTE R.95)

Ignition delay measurements at atmospheric pressure were carried out in the 3° diffuser rig described in NGTE Report R.89 using kerosene containing various additives. Regarding the fuel composition, for air temperatures in the range 750°-1000° C, it was found that the following additives had little effect upon the ignition delays of kerosene and that in no case was 50-percent reduction observed: 5-percent diethyl-ether, 5-percent propylene oxide, 5-percent nitrobenzene, 2-percent tertiarybutylhydroperoxide, 5-percent acetaldehyde, 5-percent carbon disulphide (v/v), 4-percent ferric stearate, 5-percent cobalt stearate, and 5-percent cupric stearate (w/w). Of these additives the first three were the most effective. Ethyl nitrate, amyl nitrite and ethyl nitrite when added to kerosene in high concentrations were found to cause very large reductions in ignition delay, the magnitude of which depended upon the additive concentration, as also did the slope of the ignition delay versus temperature curves. Ethyl nitrate had by far the largest effect of any of the additives tested. The two nitrous esters were less effective than diethylether at 5-percent concentrations.

N-14192*

National Gas Turbine Establishment (Gt. Brit.)
STUDIES ON THE SPONTANEOUS IGNITION OF FUELS INJECTED INTO A HOT AIR STREAM. PART IV. IGNITION DELAY MEASUREMENTS ON SOME GASEOUS FUELS AT ATMOSPHERIC AND REDUCED STATIC PRESSURES. B. P. Mullins. October 1951. 52p. 18 tabs., diagrs., photos. (NGTE R.96)

Ignition delay measurements were made at air temperatures between 600° and 1000° C and within the static pressure range 0.3 to 1.0 atmosphere on carbon monoxide, methane, ethane, calor gas, buta gas, acetylene and hydrogen using the continuous flow method of test described in NGTE Report R.89, and the present report is mainly a catalog of the experimental results.

N-14217*

Royal Aircraft Establishment (Gt. Brit.)
AN APPROXIMATION TO THE SLOW MODE OF LONGITUDINALLY DISTURBED MOTION OF AN AIRCRAFT IN LEVEL FLIGHT. A. W. Thorpe. September 1951. 45p. diagrs., 3 tabs. (RAE Aero 2438)

This report develops an approximate theory of longitudinal response which applies to the slow mode of motion after a disturbance. The present theory is complementary to that for the quick period motion which has been given by Gates and Lyon in R & M 2027. The approximate equations have been solved algebraically and the solutions tabulated. Some numerical examples have been solved to indicate the accuracy which may be expected.